Summary 153

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Effects of irrigation on the performance of grapevine cv. Tempranillo in Requena, Spain

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• In Europe, growers tend to reduce irrigation after veraison. In contrast, in Australia, deficit irrigation tends to be implemented from fruit set to veraison, a practice that has been shown to significantly reduce berry size. These different strategies may be the reflection of very different management styles and climates. It would be more risky for a highly-cropped Australian vineyard to reduce water late in the season than to do the same in a lighter-cropped European vineyard.

• Vineyards in Spain have been traditionally dry-farmed because irrigation was forbidden by law until 1996. Since then, irrigation has increased dramatically – even though many question whether this is a good trend. The goal of these authors was to test an irrigation regime consisting of moderate water applications with further reductions from veraison to harvest.

• The trial was carried out from 2000 to 2005 in an experimental Tempranillo vineyard. The vineyard is on a vertical trellis with bilateral cordons, spaced 2.45 x 2.45 m (8 x 8 feet) and oriented north-south. The soil is a clay loam to light clay texture, highly calcareous and of low fertility. This area of Spain, on the Mediterranean side, gets 430 mm (17 inches) of rain - 25% of which falls during the growing season.

• There were 2 treatments: 1) dry-farmed (rain-fed) and 2) irrigated vines. The intended irrigation regime was to gradually increase water from 8% to 30% ET_o. Then, after veraison, the objective was to apply 20% ET_o to induce a moderate water deficit. *[When asked why such low water amounts, the first author explained that vines were weak and had low leaf area, therefore needing less water. Additionally, they wanted to irrigate very little, thus mimicking premium red wine producers in Spain]*. The trial was a randomized complete block design with 6 replications. Each replication was 10 rows of 9 vines per row.

• **Effect on water status** . The experimental period included two particularly dry years (2000 and 2005). The lowest values of leaf water potential of the rain-fed vines were reached in August, and were between -1.4 MPa and -1.7 MPa (-14 to -17 bars). In contrast, the lowest values of the irrigated vines were -1.2 to -1.4 MPa.(-12 to -14 bars).

• **Effect on vine growth and yield**. Irrigation increased vine vigor, as indicated by the increased pruning weights and leaf area. Irrigation also increased evapotranspiration (by 30% on average). Yield was linearly related to evapotranspiration, with an average increase in the irrigated vines of 31%. This increase was mainly due to increased berry size.

• **Effect on must**. 1) Overall, irrigation did not significantly affect must sugar levels. In those years in which differences were significant, the authors observed an interesting trend:

- when leaf area/yield values were equal or <1 m^2/kg, irrigation increased must Brix;
- when non-irrigated vines had much higher leaf area/yield values than irrigated vines, irrigation had the opposite effect: it decreased Brix – or, as was the case 3 years out of 6, it did not affect Brix.

2) Irrigation increased juice malic acid and pH.

• **Effect on wine quality.** When fruit reached 21 Brix, researchers made wine on a 30 kg scale with 6 replications per treatment. 1) Overall, irrigation did not significantly affect wine anthocyanins. However, irrigation did reduce anthocyanins and total phenols in the years of relatively low yields (2001, 2003, 2005). 2) In general, irrigation decreased wine color (even if the difference was only large enough to be significant 3 years out of 6. 3) Alcohol concentrations decreased as crop level increased. This effect was more pronounced in the non-irrigated vines.

• The authors emphasize that the effect of irrigation on wine composition was very dependent on climatic conditions and crop load. Even though both 2000 and 2005 were dry years, yield was much higher in 2000 than in 2005. In the heavy-cropped year (2000), irrigation helped to ripen the crop. But the opposite happened in the lighter-crop year (2005), in which non-irrigated vines ranked higher for most wine characteristics. *[Unfortunately, the authors do not elaborate on how they rank quality. They do imply that the low alcohol and sugar of year 2000 was definitely considered "bad quality"].*

In summary, in this study, irrigation had some negative effects on wine composition. It altered the balance between malic and tartaric acids, led to an increase in wine pH, and caused a small decrease of anthocyanins and color. Even though the authors didn't measure it, they also expected the vigor of the irrigated vines to adversely influence cluster microclimate. For these reasons, the authors view irrigation as "a tool to mitigate the negative effect of increasing crop level".

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